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Professions in the Modern State

IN his New Year message the President said: " In these days of specialisation there is bound to be a tendency to split into sections; but despite our many and varied interests, may I make a strong plea for unity so that, as a profession, we may be able to speak, when necessary, with one voice? "

It happens, perhaps coincidentally, that at the present time several aspects of professional life are commanding public and official attention, and the one factor common to them all is the importance of unity both within any single profession, and of professional men and women one with the other.

In the forefront of the current scene is the request by the medical profession for a reconsideration of their emoluments in the light of changed conditions. At the same time attention is being drawn—notably in the correspondence columns of *The Times*—to the apparent disparity between the salaries of scientists and university teachers and those of senior personnel in the municipal and other services. Underlining, and as it were drawing the logical conclusion from these things, is the publicity the press is giving to the number of emigrants from this country to Canada, Australia and elsewhere, not a few of them scientists and members of the learned professions.

For good or ill the nation has accepted a form of society in which the claims of the artisan for " equality " appear to receive more consideration than those of the professions for the reasonable maintenance of their standards. In the case of the medical profession, with whom we have close and cordial ties, it would not be proper for this journal to comment upon their negotiations with the Minister of Health; but it is salutary to recall the degree of public hostility with which their proper and reasonable hesitations over the Health Service in its original form were greeted. Certain politicians, and many newspapers, thought fit to use towards the medical profession expressions they would not have dared employ to dockers or to coalminers, and as *The Economist* has observed, " They (the doctors) know only too well that the Government will always be as firm with professional organisations as it will be weak with trade unions."

The ethic which makes it impossible for members of the professions to withdraw their services to the detriment of the community is something which, far from denying them consideration, should entitle them to more.

As *The Times* correspondence makes clear, the same problems exist in the academic world. Salaries within the universities have increased it is true, but for the most part they still are inadequate. Senior posts are ill rewarded having regard to the qualifications called for, while junior lecturers and demonstrators find themselves woefully behind their contemporaries in commerce and industry. As a result many academic posts are becoming more difficult to fill, while at the same time the community seems to be determined as ever that only those in a position to utter threats, and to carry them out shall be allowed consistently to better their lot.

It may be objected that men and women do not enter the professions for material reward in the first place; and professional life would be the poorer if they did so. But any nation's intellectual and cultural life must be, in some measure at least, conditioned by the community's acceptance of a tolerable standard for those who contribute the things of the mind rather than of the hand. Does the modern community accept this principle? It is necessary only to recall the storm of indignation which greeted the suggestions that Her Majesty's judges be restored to something like their pre-war material status to find the answer.

What has all this to do with our own profession? Its purpose is to underline the plea made by the President. Unity is necessary to us as never before. The large-animal practitioner cannot afford to be indifferent to the plight of his town colleague whose practice is imperilled by the opening of a free clinic a few doors away. The teacher may ignore at his peril the problems of the veterinary civil servant. The veterinarian advising a commercial company must not separate himself from the research worker and the clinician. A supreme advantage of belonging to a small profession is the opportunity it provides for personal contribution to corporate unity. If the best is made of that advantage, the veterinary profession will be able to face the future with a confident mind.

The Effect of the Continuous Administration of Diets Containing Low Levels of Tetracyclines on the Incidence of Drug-resistant *Bacterium coli* in the Faeces of Pigs and Chickens: The Sensitivity of the *Bact. coli* to Other Chemotherapeutic Agents

BY

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The Animal Health Trust, Lilystone Hall, Stock, Essex

IN recent studies (Smith & Crabb, 1956) it was shown that the frequent use of chemotherapeutic agents, including tetracyclines, in the prevention and treatment of white scours in calves sometimes led to the development of a *Bacterium coli* flora of the intestinal tract that was predominantly drug-resistant.

Many pigs are now fed on diets containing chlortetracycline* and oxytetracycline†, either singly or in combination, as a means of growth promotion. This system has been practised for the last three years on many farms in Great Britain and it was of interest to determine whether it had had a similar effect on the *Bact. coli* faecal flora of the pig as we had observed in the calves.

In this paper the *Bact. coli* faecal flora of 37 herds in which low-level tetracycline feeding was being practised is compared with that of a similar number of herds where such additives had never been fed. Great difficulty was experienced in finding herds belonging to the latter category because most farmers supplement the diet of their young pigs before weaning with "creep feed" containing tetracyclines. Many farmers were extremely vague as to the formula of their pig food; a surprising number were using antibiotic supplements without being aware of the fact. In the case of a few farms it was possible to examine specimens of pig faeces before, as well as after, the introduction of tetracycline feeding. We were able to obtain faecal specimens from only 10 flocks of chickens fed diets containing tetracyclines because this practice is very much less commonly employed in chickens than in pigs and then it is usually used for much shorter periods of time.

Observations were also made on the sensitivity of the *Bact. coli* in the faeces of pigs, chickens, and sheep to streptomycin, chloramphenicol, and sulphadimidine. The faecal specimens from sheep were included because those in Great Britain are never fed diets containing tetracyclines and, consequently, it was considered that they might form an interesting comparison with the pig and chicken specimens.

Materials and Methods

Faecal specimens

These were usually obtained by rubbing a sterile swab on a freshly-voided portion of faeces. When a specimen was collected from a pen containing several animals, care was taken to see that it was taken from the droppings of one animal and not from a mixture of droppings. Some specimens were taken as rectal swabs. Wherever possible, all specimens were examined bacteriologically on the day of collection. The *Bact. coli* were found to die relatively rapidly in faecal swabs taken from pigs and chickens and the other bacteria multiplied thus rendering a satisfactory bacteriological examination difficult.

Chemotherapeutic sensitivity tests

Petri plates containing MacConkey agar were dried for two hours in a 37° C. incubator with their lids partly removed and then stored at 3° C. until required. For use, a faecal swab was rubbed gently over the surface of a plate of medium. Sterile filter paper discs, approximately 6 mm. in diameter, containing different chemotherapeutic agents were then placed *firmly* on the surface of the medium at similar distances from each other. The amount of chemotherapeutic agents contained in the discs were: oxytetracycline hydrochloride, 8 and 50 μg.; streptomycin sulphate, 8 and 100 μg.; sulphadimidine, 130 μg., and chloramphenicol, 8 μg. Oxytetracycline and streptomycin were always tested at both the high and the low levels. When these two agents alone were being studied it was possible to use half instead of the whole of the surface of a plate. It was not considered necessary to employ chlortetracycline as well as oxytetracycline in these tests in view of their similarity as far as bacterial sensitivity and resistance is concerned. The plates were incubated at 28° C. for 18 hours and then read. The amount of bacterial growth resembling *Bact. coli* was first recorded by a notation in which a completely confluent growth was scored as + + + +, lesser amounts being recorded as from + + + to +. The great majority of faecal specimens from all species of animals examined yielded a + + + + growth and the usual tests, including that of acid and gas production in MacConkey broth at 44° C., indicated that at least 95 per cent. of individual colonies examined that resembled *Bact. coli* morphologically were, in fact, *B. coli* type I. The width of the zones of inhibition around the discs was next carefully measured. When drug-resistant colonies appeared within the zone of inhibition the approximate number present around the high-level disc, if two discs of the relevant drug were employed, was recorded. If very large numbers were present an attempt was made to gain an impression of the approximate relationship between

* Aureomycin.
† Terramycin.

the numbers of sensitive and resistant *Bact. coli* in the faecal specimen. The method of recording employed was as follows:—

All resistant—when growth of *Bact. coli* of uniform thickness took place right up to the edge of the disc (Fig. 1a).

Largely resistant—when *Bact. coli* growth took place right up to the disc but a distinct band of growth proximal to the disc was not so thick as the remainder of the growth (Fig. 1b).

Mainly sensitive—when 20 to 200 resistant colonies were present within the zone of inhibition (Fig. 1c).

Nearly all sensitive—when 1 to 20 resistant colonies were present within the zone of inhibition (Fig. 1d).

All sensitive—when a distinct zone not containing any colonies of *Bact. coli* was present around the disc (Fig. 1e).

When fresh specimens of faeces were examined, *Bact. coli* for all practical purposes were the only bacteria that were obvious on the MacConkey plates. The two levels of oxytetracycline were employed because it was thought, at the commencement of the experiment, that the low-level feeding of tetracyclines might result in the emergence of *Bact. coli* that were only slightly resistant, by ordinary standards, to tetracyclines. This was not the case, the *Bact. coli* in the faecal specimens always being either quite sensitive or quite resistant to the tetracyclines. Consequently, the method of recording outlined above was found to be ideal, the numbers of resistant colonies always being assessed by reference to the disc containing the higher rather than the lower level of drug. Considering faecal specimens from all species examined, the width of the band of inhibition around the disc in the case of specimens containing sensitive *Bact. coli* was as follows:—

High level terramycin	8—10 mm.
Low " "	3— 5 mm.
High " streptomycin	10—12 mm.
Low " "	5— 7 mm.
Chloramphenicol	4— 6 mm.
Sulphadimidine (sulphamezathine)	3—6 mm.

As expected, difficulty was sometimes experienced in assessing sulphadimidine sensitivity when the amount of *Bact. coli* growth was profuse. Consequently, when the *Bact. coli* in any specimen appeared resistant to sulphadimidine they were retested using horse-blood agar as medium and a light bacterial inoculum (Smith & Crabb, 1956).

Determination of minimum inhibiting concentration of oxytetracycline for resistant strains of Bact. coli

A single tetracycline-resistant colony resembling *Bact. coli* from each plate on which such colonies were present was subcultured on to MacConkey agar, incubated at 37° C., and a single isolated colony picked and incubated in MacConkey broth at 44° C. to confirm that it was *Bact. coli* faecal type I; approximately 95 per cent. of the colonies so selected belonged to this type. The cultures were then streaked on to plates of nutrient agar containing two-fold falling concentrations of oxytetracycline hydrochloride from 1,600 to 25 μg. per ml. of medium. The plates were incubated at 37° C. for 24 hours and the lowest concentration of oxytetracycline hydrochloride that prevented growth was taken as the minimum inhibiting concentration (M.I.C.).

Counts of Bact. coli *in faeces*

These were carried out by the method of Miles & Misra (1938) using MacConkey agar as the counting medium.

Results

The effect of tetracyclines in the faeces on the method of examination

Since many of the faecal specimens whose examination is reported below were taken from pigs and chickens that were being fed tetracyclines at the time their faeces were sampled, it was essential to know at the outset whether the consequent presence of tetracyclines in the faecal specimens would have any influence in preventing tetracycline-sensitive strains of *Bact. coli* growing on media inoculated with these specimens. Pig and chicken faeces were sterilised by autoclaving and known amounts of a tetracycline-sensitive strain of *Bact. coli* mixed into them. Each specimen was divided into two portions, one served as a control and 5 μg. per g. of oxytetracycline hydrochloride was added to the other in the case of pig faeces, and 30 μg. per g. in the case of chicken faeces. These amounts were used because they were just larger than those found in the contents of the large intestine of pigs (Taylor, 1955) and the faeces of chickens (Luther *et al.*, 1953-4) when these animals had been fed levels equal to or greater than the highest levels employed in the present studies. Swabs were taken from each specimen and rubbed over a plate of MacConkey agar by exactly the same method as was employed in all the investigations reported below. The plates were incubated at 28° C. for 18 hours. The *Bact. coli* colonies growing on the plates were then compared (Table I). No difference was noted between the number and size of the colonies originating from the specimens containing oxytetracycline and from the corresponding controls.

TABLE I

THE CULTIVATION ON MACCONKEY'S MEDIUM OF TETRACYCLINE-SENSITIVE *Bact. coli* FROM FAECES CONTAINING OXYTETRACYCLINE

Number of *Bact. coli* × 10^4 added per g. of sterilised faeces	Number of colonies that grew on media smeared with faeces containing the following amounts of oxytetracycline (μg. per g.)			
	0	5	0	30
1	16	40	33	18
10	200	180	400	450
100	*	*	*	*
	pig faeces		chicken faeces	

* = uncountable.

These experimental results were borne out later by practical observations on pigs and chickens that had been fed diets containing tetracyclines for a few days only. Their faeces yielded quite good growths of tetracycline-sensitive *Bact. coli*.

The distribution of tetracycline-resistant and tetracycline-sensitive Bact. coli *in the faeces of pigs fed low levels of tetracyclines and in the faeces of pigs never fed these agents*

The results of examining faecal samples from 370 pigs that had been fed diets containing tetracyclines and from a similar number of pigs kept on farms where tetracyclines had never been fed is shown in Table II. In each case, the 370 faecal samples were obtained from 37 farms, 10 pigs from each farm, being sampled; all the herds were self-contained. The 10 samples from each farm, wherever possible, were taken from pigs in different pens and of different ages. Oxytetracycline was the agent employed in 15 of the 37 tetracycline-fed herds of pigs at levels of 4 to 10 g. per ton of food. On 20 of the farms, chlortetracycline was employed at levels of 10 to 30 g. per ton. On the remaining two farms a combination of oxytetracycline and chlortetracycline, 2 g. of each per ton, was used. The agents had been employed on these 37 farms for periods of 5 to 36 months (average 18.2 months). They were fed to the fattening stock on all 37 farms. On some they were also given to the breeding and young stock. Despite the differences between the individual tetracycline-fed pigs referred to above, all have one thing in common when compared with the pigs not so fed—a large proportion of tetracycline-resistant *Bact. coli* in their faeces. Consequently, the results are not considered separately in Table II.

TABLE II

THE DISTRIBUTION OF TETRACYCLINE-RESISTANT AND SENSITIVE *Bact. coli* IN THE FAECES OF PIGS FED LOW LEVELS OF TETRACYCLINES AND IN THE FAECES OF PIGS NEVER FED THESE AGENTS

Type of pigs	Number of faecal specimens from 370* pigs in which the *Bact. coli* were				
	All resistant	Largely resistant	Mainly sensitive	Nearly all sensitive	All sensitive
Tetracycline fed	327	27	11	2	3
Never fed Tetracyclines	0	4	61	87	218

* Ten specimens were examined from each of 37 herds of pigs in each case.

There was little difference between the amount of *Bact. coli* growth which occurred on the plates of media prepared from the faecal specimens from the tetracycline-fed pigs and from the other pigs; 262 of the 370 samples from the tetracycline-fed pigs and 284 from the other pigs yielded a confluent (++++) growth of *Bact. coli*.

Streptomycin tests on the specimens referred to above were carried out at the same time as the tetracycline tests. In contrast to the tetracycline tests, no difference was noted between the tetracycline-fed pigs and the other pigs as regards streptomycin resistance; the *Bact. coli* in all 740 faecal specimens were sensitive to streptomycin.

The degree of tetracycline-resistance amongst resistant strains of Bact. coli *isolated from the faeces of pigs fed and not fed tetracyclnes*

The results of determining the minimum inhibitory concentration (M.I.C.) of oxytetracycline hydrochloride for strains of *Bact. coli* recorded in the above experiment as being tetracycline-resistant is shown in Table III. Of these strains 258 were isolated from

TABLE III

THE MINIMUM INHIBITORY CONCENTRATION (M.I.C.) OF OXYTETRACYCLINE HCL FOR TETRACYCLINE—RESISTANT STRAINS OF *Bact. coli* ISOLATED FROM THE FAECES OF PIGS

Origin of resistant strains	Number examined*	Percentage for which the M.I.C. was (μg. per ml.)					
		1,600	800	400	200	100	<100
Pigs fed tetracyclines	258	25	47	11	13	4	0
Pigs never fed tetracyclines	91	39	24	25	7	5	0

* Not more than one strain of *Bact. coli* was tested from the faeces of any pig.

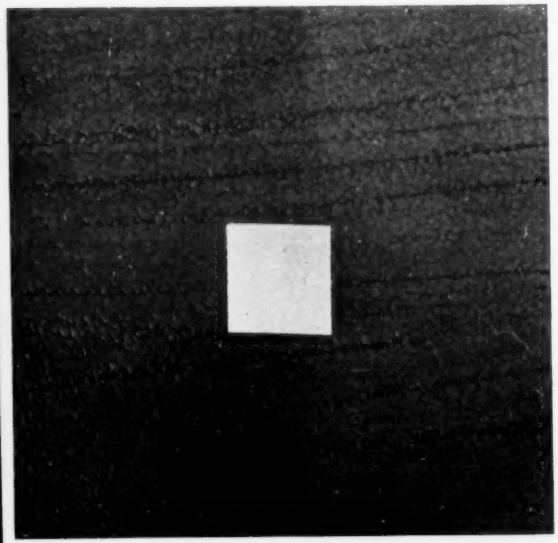
the faeces of pigs fed diets containing tetracyclines and 91 from the faeces of pigs kept on farms where the tetracycline-feeding had never been practised; no more than one strain was examined from any pig. There was very little difference in the degree of resistance between the series of strains from each of the two sources. The M.I.C. for all the strains was at least 100 μg. per ml., the great majority of them exhibiting a very high degree of resistance.

The phage-typing of strains of Bact. coli *present in the faeces of pigs fed tetracyclines*

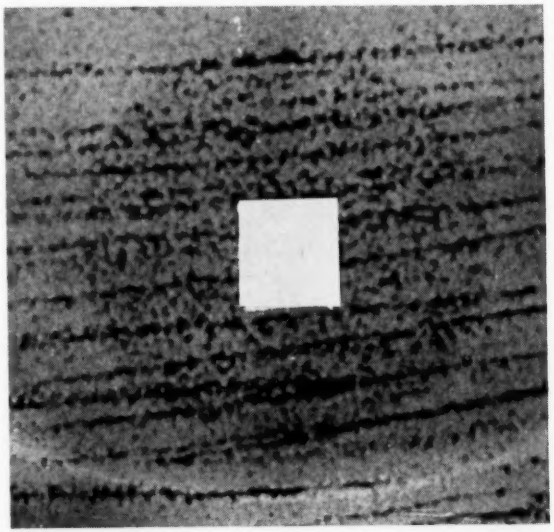
The phage-typing of tetracycline-resistant *Bact. coli* showed that a number of different phage types were usually present in the faeces of pigs that were being fed tetracyclines on the same premises, more than one phage type often being present in the faeces of the same pig. For example, 21 different phage types were found when 10 colonies of *Bact. coli* originating from the faeces of each of 10 pigs (100 colonies) kept on the same farm were phage-typed.

The numbers of tetracycline-sensitive and tetracycline-resistant Bact. coli *in the faeces of pigs fed diets with and without tetracycline additives*

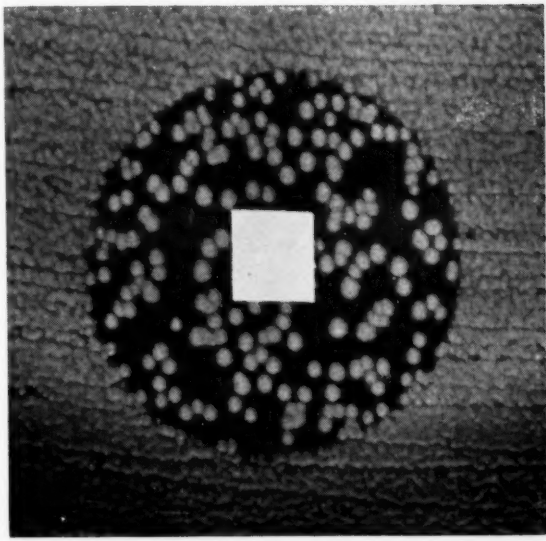
The numbers of viable tetracycline-resistant and tetracycline-sensitive *Bact. coli* found in the faeces of 15 pigs originating from farms where tetracycline feeding (10 g. chlortetracycline per ton) had been practised for the last two years and in the faeces of 15 pigs from farms where tetracycline feeding had never been practised is illustrated in Table IV; the counts were carried out on both MacConkey agar and MacConkey agar containing 20 μg. per ml. of oxytetracycline hydrochloride so that estimates of the numbers of sensitive and resistant *Bact. coli* could be obtained. Each group of 15 pigs came from three farms, five per farm. Although the viable counts differed from pig to pig, taken as a whole, it was found that similar counts of *Bact. coli* were present



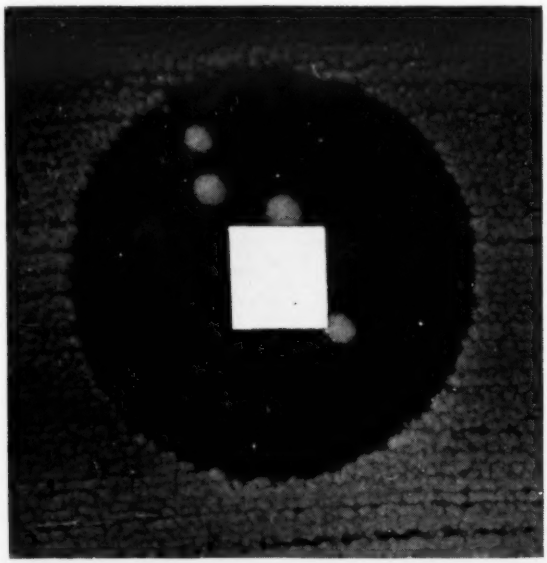
1a.—*Bact. coli* all resistant.



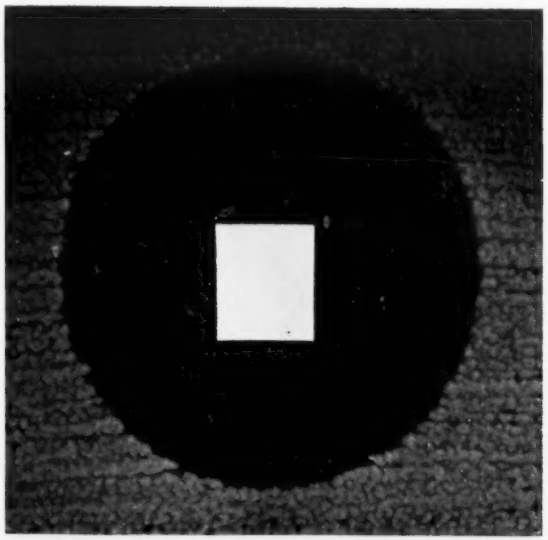
1b.—*Bact. coli* largely resistant.



1c.—*Bact. coli* mainly sensitive.



1d.—*Bact. coli* nearly all sensitive.



1e.—*Bact. coli* all sensitive.

FIG. 1.—The classification of the amount of tetracycline resistant *Bact. coli* growth found in pig faeces.

in the faeces of one group of pigs as in the other. However, the vast majority, if not all, of the *Bact. coli* in the faeces of the tetracycline-fed pigs were resistant to tetracyclines. Small numbers of tetracycline-resistant *Bact. coli* were also found in the faeces of five of the pigs that had never received diets containing tetracyclines.

TABLE IV

THE NUMBERS OF TETRACYCLINE-SENSITIVE AND RESISTANT *Bact. coli* IN THE FAECES OF PIGS FED DIETS WITH AND WITHOUT TETRACYCLINE ADDITIVES

Viable count of *Bact. coli* × 10^4 per g. in the faeces of 15 pigs

Fed tetracyclines on			Not fed tetracyclines on		
	Mac Conkey agar	Tetracycline* MacConkey agar		Mac Conkey agar	Tetracycline* MacConkey agar
(1)	6	4	(16)	8	0
(2)	12	6	(17)	25	0
(3)	200	40	(18)	60	0·05
(4)	200	250	(19)	200	0
(5)	250	300	(20)	500	1·0
(6)	400	500	(21)	500	0·9
(7)	500	500	(22)	600	0·1
(8)	600	600	(23)	1,000	0
(9)	1,000	1,250	(24)	1,000	0
(10)	1,250	1,000	(25)	1,000	0·25
(11)	1,250	1,500	(26)	1,250	0
(12)	4,500	4,500	(27)	1,500	0
(13)	5,000	5,500	(28)	2,000	0
(14)	5,000	6,000	(29)	3,000	0
(15)	6,000	5,000	(30)	5,000	0

* Containing 20 μg. per ml. oxytetracycline hydrochloride

The presence of tetracycline-resistant Bact. coli *in the faeces of pigs before and after commencing tetracycline feeding*

The results of testing the *Bact. coli* in the faeces of 30 pigs, 10 from each of three farms, immediately before, and eight weeks after, commencing to feed them on diets containing tetracyclines (either 10 or 18 g. per ton of chlortetracycline or 10 g. per ton oxytetracycline) is shown in Table V. Tetracycline feeding had never been employed previously on these farms. A profound shift was noticed on each farm from a position in which the mass of the *Bact. coli* in the faeces of the pigs at the commencement of the experiment was tetracycline-sensitive to a position in which the mass was tetracycline-resistant. No alteration took place as far as streptomycin resistance was concerned; the *Bact. coli* present in the faeces before and at the end of the experiment were all sensitive to this agent.

The presence of tetracycline-resistant Bact. coli *in the faeces of piglets suckling sows fed tetracyclines*

The faeces of 40 piglets selected from litters on four different farms were submitted to sensitivity tests. All these piglets were completely dependent for food on the milk of sows to whom it was customary to feed diets containing tetracyclines and whose faeces contained large numbers of tetracycline-resistant *Bact. coli*. The *Bact. coli* in the faeces of 37 of the 40 piglets were all resistant to tetracyclines;

TABLE V

THE PRESENCE OF TETRACYCLINE-RESISTANT *Bact. coli* IN THE FAECES OF PIGS BEFORE AND EIGHT WEEKS AFTER COMMENCING FEEDING TETRACYCLINES

Farm No.	Time*	Number of 10 faecal specimens in which the *Bact. coli* were: All resistant	Largely resistant	Mainly sensitive	Nearly all sensitive	All sensitive
1	Before feeding	0	0	2	2	6
	After	10	0	0	0	0
2	Before feeding	0	0	1	4	5
	After	5	4	1	0	0
3	Before feeding	0	0	0	0	10
	After	10	0	0	0	0

* Oxytetracycline 10 g. per ton was the agent employed on Farm 1, chlortetracycline, 10 g. per ton on Farm 2 and chlortetracycline, 18 g. per ton on Farm 3.

those in the remaining three were largely resistant. No streptomycin-resistant *Bact. coli* were found in these samples.

The persistence of tetracycline-resistant Bact. coli *amongst the faecal flora of pigs after the withdrawal of tetracycline feeding.*

The results of testing the *Bact. coli* in the faeces of pigs kept in four farms immediately before giving up the use of tetracycline feeding and at three to seven months afterwards is shown in Table VI. Different batches of pigs were sampled on each occasion, those tested on the first occasion having been killed before the second test, as part of the

TABLE VI

THE PERSISTENCE OF TETRACYCLINE-RESISTANT *Bact. coli* AMONGST THE FAECAL FLORA OF PIGS AFTER THE WITHDRAWAL OF TETRACYCLINE FEEDING

Farm No.	Time	Number of 10 faecal specimens in which the *Bact. coli* were: All resistant	Largely resistant	Mainly resistant	Nearly all sensitive	All sensitive
4	Before withdrawal	10	0	0	0	0
	7 months after withdrawal	1	6	2	1	0
5	Before withdrawal	8	2	0	0	0
	7 months after withdrawal	8	2	0	0	0
6	Before withdrawal	10	0	0	0	0
	7 months after withdrawal	9	1	0	0	0
7	Before withdrawal	10	0	0	0	0
	7 months after withdrawal	10	0	0	0	0

Tetracycline feeding had previously been practised continuously on these four farms for approximately two years. In no case were the same pigs sampled on each occasion.

normal farm procedure. Apart from the faeces of the pigs on farm 4, which showed some increase in the proportion of tetracycline-sensitive *Bact. coli*, little or no change to a tetracycline-sensitive *Bact. coli* flora was noted in the faeces of the pigs on the other three farms after the period of three to seven months during which tetracyclines were not fed.

The presence of intestinal disease amongst pigs fed diets containing tetracyclines

Although no detailed studies were carried out, enquiries were made as to the presence of intestinal disease amongst pigs on the 37 farms where tetracycline-feeding was practised. "Runt" pigs classified as such because of their poor bodily condition, a feature usually accompanied by chronic diarrhoea, were noted on several of these farms. An outbreak of necrotic enteritis (not due to *Salmonella choleraesuis*) was in progress amongst the pigs on one farm at the time the faecal samples were collected. Scouring in pigs, considered to be associated with *Bact. coli*, was also noted on some farms. In the few cases studied, they could be controlled by the use of streptomycin by mouth, the tetracyclines in the "creep" or other feed having had no apparent beneficial effect. One significant observation was made on farms where tetracycline diets were fed to the sows and where the piglets were weaned at 10 days of age, their diet then consisting of a proprietary milk substitute containing oxytetracycline. On four of the farms included in the present investigation, and on another four not so included, these conditions applied. Quite serious outbreaks of scours of the *Bact. coli* type with deaths were more common amongst the piglets on these farms than on farms where a similar system was practised except that the sows had never been fed tetracyclines. The condition was so serious on one farm that the early weaning procedure had to be discontinued. On some of the others, oral streptomycin therapy was employed with beneficial results.

The diseased pigs on the tetracycline-fed herds referred to above had one thing in common—a completely tetracycline-resistant *Bact. coli* faecal flora.

The distribution of tetracycline-resistant and tetracycline-sensitive Bact. coli *in the faeces of chickens fed tetracyclines and in the faeces of chickens never fed these agents*

The results of examining 100 faeces samples, 10 per flock from chickens that had been fed diets containing tetracyclines, and 100 samples, 10 per flock, from chickens that had never been fed tetracyclines are shown in Table VII. All chickens were kept either on free range or on deep litter. Oxytetracycline was the agent employed in 9 of the 10 tetracycline-fed flocks, at levels of 100 g. per ton in seven flocks and at 15 and 10 g. per ton in the other two flocks. Chlortetracycline, 18 g. per ton, was used in the remaining flock. Unlike pigs, the agents were only fed to the chickens for short periods varying from 2 to 12 weeks (average 6 weeks), tetracyclines never having been used previously on most of the farms. However, as in the case of the pigs, an exceedingly higher proportion of tetracycline-resistant strains of *Bact. coli* were found in the chickens fed tetracyclines than in the chickens never fed these agents. Of three flocks in which tetracyclines were fed for two weeks only, the *Bact. coli* in 26 of the total of 30 specimens tested were all resistant. It was possible to examine specimens from one of these flocks before tetracycline feeding was instituted when a small proportion of resistant *Bact. coli* were found in four faecal specimens, the remaining six containing sensitive *Bact. coli* only.

TABLE VII

THE DISTRIBUTION OF TETRACYCLINE-RESISTANT AND -SENSITIVE *Bact. coli* IN THE FAECES OF CHICKENS FED TETRACYCLINES AND IN THE FAECES OF CHICKENS NEVER FED THESE AGENTS

Type of chickens	Number of faeces specimens from 100 chickens * in which the *Bact. coli* were				
	All resistant	Largely resistant	Mainly sensitive	Nearly all sensitive	All sensitive
Tetracycline fed	84	13	0	1	2
Never fed tetracyclines	0	1	2	24	73

* Ten specimens were examined from each of 10 flocks of poultry in each case.

There was little or no difference between the amount of *Bact. coli* in the 100 faeces samples of the tetracycline-fed chickens than in those not so fed; 85 of the former and 88 of the latter yielded a confluent (++++) growth of *Bact. coli* on the test plates of MacConkey agar.

As in the case of the pigs, all the resistant *Bact. coli* from the tetracycline-fed chickens and the chickens not so fed were shown to require high concentrations of oxytetracycline to inhibit their growth. The minimum inhibitory concentration of oxytetracycline hydrochloride was never less than 100 μg. per ml. for any of the resistant strains of *Bact. coli*, the average being 1,100 μg. per ml. for 60 resistant strains from tetracycline-fed chickens and 560 μg. per ml. for 25 resistant strains from chickens that had never been fed tetracyclines.

No streptomycin-resistant *Bact. coli* were noted in any of the 200 faecal specimens from chickens referred to above.

The distribution of antibiotic-sensitive and antibiotic-resistant Bact. coli *in the faeces of the pig, chicken, and sheep population*

The results of testing the sensitivity of the *Bact. coli* in the faeces samples from 100 pigs, 100 chickens, and 100 sheep to oxytetracycline, sulphadimidine, streptomycin, and chloramphenicol is shown in Table VIII. The collections were arranged so as to avoid obtaining more than one sample from the same farm, those from sheep and pigs being collected at a market place in the area in which the investigations referred to above were made. No history at all was available of the animals whose faeces were sampled. All the *Bact. coli* present in the faeces of sheep, animals that are only rarely treated with chemotherapeutic agents, were sensitive to the four chemotherapeutic agents against which they were tested. On the other

hand, a very considerable proportion of the *Bact. coli* in the pig faeces were resistant to tetracyclines but not to the other agents. A lesser proportion of tetracycline-resistant *Bact. coli* were found in the chicken than in the pig faeces. *Bact. coli* resistant to streptomycin were found in only two of the 300 faecal samples (both from pigs) and chloramphenicol-resistant *Bact. coli* were only found in one sample (chicken). A significantly higher proportion of sulphadimidine-resistant *Bact. coli* were found in chickens than in pigs and sheep.

TABLE VIII

THE SENSITIVITY TO CHEMOTHERAPEUTIC AGENTS OF THE *Bact. coli* PRESENT IN THE FAECES OF 100 PIGS, CHICKENS OR SHEEP

Chemotherapeutic agent	Type of faeces	Number of 100 faeces specimens in which the *Bact. coli* were: All resistant	Largely resistant	Mainly sensitive	Nearly all sensitive	All sensitive
Oxytetracycline	Pig	18	6	7	22	47
	Chicken	5	3	10	14	68
	Sheep	0	0	0	0	100
Sulphadimidine	Pig	2	0	2	4	92
	Chicken	16	1	4	6	73
	Sheep	0	0	0	0	100
Streptomycin	Pig	0	0	0	2	98
	Chicken	0	0	0	0	100
	Sheep	0	0	0	0	100
Chloramphenicol	Pig	0	0	0	0	100
	Chicken	0	1	0	0	99
	Sheep	0	0	0	0	100

Additional faecal samples were collected from 130 chickens at a market and examined for tetracycline sensitivity. These chickens, which came from different flocks, were of the "backyard" type and it was highly probable that they would have had less contact with tetracyclines than the 100 reported above which were much higher-class stock. The *Bact. coli* in the faeces of 120 of the 130 chickens were all sensitive to oxytetracycline. A very small number of tetracycline-resistant *Bact. coli* were present in the faeces of nine of the chickens; the *Bact. coli* in the remaining specimen were all resistant.

A comparison between the results for the market pigs and pigs entering a bacon factory covering the same operational area as the market is shown in Table IX. The market pigs that were sampled consisted mainly of recently weaned "store" pigs and about 40 per cent. of sows. Because it is advised not to feed breeding stock antibiotic supplements, it was considered that these pigs would not have been subjected to tetracycline feeding to the same extent as the bacon pigs. This probable difference was reflected in the sensitivity tests. For example, the percentage of faecal specimens in which the *Bact. coli* were all tetracycline-resistant was twice as high in the bacon pigs (36 per cent.) as in the market pigs (18 per cent.).

Discussion

The present studies indicate that the practice of feeding diets containing tetracyclines to pigs and poultry almost invariably results in the emergence of a *Bact. coli* faecal flora that is predominantly tetracycline-resistant. The comparison between the distribution of tetracycline-resistant and tetracycline-sensitive strains in the faeces of pigs fed diets with and without tetracycline additives, the examination of faecal specimens before and after the commencement of tetracycline feeding and the fact that the tetracycline-resistant *Bact. coli* from tetracycline-fed animals were not resistant to other chemotherapeutic agents makes this conclusion inescapable.

TABLE IX

THE DISTRIBUTION OF TETRACYCLINE-RESISTANT AND -SENSITIVE *Bact. coli* IN THE FAECES OF MARKET PIGS AND BACON PIGS

Type of Pigs	Number of faecal specimens examined	Per cent of faeces specimens in which the *Bact. coli* were: All resistant	Mainly resistant	Mainly or nearly all sensitive	All sensitive
Bacon	276	36	3	35	26
Market	100	18	6	29	47

Approx. 40 per cent. of the market pigs were sows; the remainder were mainly recently weaned pigs.

There is no reason to suppose that the feeding of tetracyclines had induced tetracycline resistance in previously sensitive *Bact. coli*. The evidence, in fact, indicates that the tetracyclines had gradually suppressed the multiplication of the large numbers of sensitive *Bact. coli* present before tetracycline feeding was commenced thus permitting resistant *Bact. coli*, already present in the herd in very small numbers, to occupy the position previously occupied by the sensitive strains. That is, the situation found in the tetracycline-fed herds in the present investigation had been brought about purely by selection and not adaptation. One reason for adopting this view was the presence of very small numbers of tetracycline-resistant *Bact. coli* in a number of herds that had never been exposed in any way to tetracyclines. These *Bact. coli* closely resembled those found in the tetracycline-fed herds, particularly in regard to their degree of tetracycline resistance which was very much higher indeed than the concentrations of tetracycline that would normally be obtained in the gut of tetracycline-fed pigs. Also it was impossible in the laboratory to produce permanently tetracycline-resistant strains of *Bact. coli* from sensitive ones.

The results indicate that the effect of feeding tetracyclines, as far as *Bact. coli* resistance is concerned, is by no means limited to the animals directly receiving the supplements. For example, piglets acquired resistant *Bact. coli* from their mothers on farms where the sows were fed tetracyclines. Again, on certain farms, a high proportion of tetracycline-resistant *Bact. coli* were found in the faeces of pigs, which themselves had never received tetracyclines, at considerable periods after the practice of tetracycline-feeding was discontinued, indicating that the whole *Bact. coli* population of the premises had been altered.

The results of testing the sensitivity to chemotherapeutic agents of the *Bact. coli* from different species give a reasonably accurate reflection of the extent to which the particular species were exposed

to the different chemotherapeutic agents. Although the studies have been concerned mainly with tetracyclines, the presence of a relatively high proportion of sulphadimidine-resistant *Bact. coli* in the faecal specimens from chickens is noteworthy since the sulphonamides are widely used prophylactically and therapeutically in the control of coccidiosis.

Since *Bact. coli* is associated with disease, particularly in the young pig, it is obvious from this aspect that the continuous feeding of pigs with tetracyclines is a bad policy because in tetracycline-fed herds the *Bact. coli* would be mainly tetracycline-resistant; treatment of such disease with these drugs would be of no avail. Although it can be argued that other agents such as streptomycin could be employed instead in the treatment of those diseases in tetracycline-fed herds, it is questionable whether any of these agents can be employed so conveniently as the tetracyclines which are readily available in a crude form suitable for adding to pig food. It is conceivable, too, that the effects of tetracycline-feeding may not be limited to *Bact. coli*. The decision has to be made as to whether it is better to feed tetracyclines continuously to obtain a growth-stimulating effect or to reserve their use either for when outbreaks of disease occur or for giving for very limited periods only to piglets that have been weaned early.

The high proportion of tetracycline-resistant *Bact. coli* found in the faeces of the pigs entering the bacon factory indicates that the effect of tetracycline feeding, as far as the *Bact. coli* population of pigs in general is concerned, is of considerable magnitude. Its continued use, particularly if employed in other species of animals also, might well lead to the *Bact. coli*, and possibly other bacteria, in the domestic animal population being predominantly tetracycline-resistant. This would undoubtedly have an impact on the treatment of *Bact. coli* infection in those animals and possibly in other species, including man, with which they come in contact. It is apparent that considerations of this nature should be given very serious thought before any chemotherapeutic agent is permitted to be used in such a widespread manner as the tetracyclines have been used in pig nutrition.

Summary

1. A very much higher proportion of tetracycline-resistant *Bact. coli* were found in the faeces of pigs and chickens which had been fed diets containing low levels of tetracyclines than were found in the faeces of pigs and chickens kept on farms where these agents had never been fed.

2. Examination of faecal samples from pigs before and after commencing tetracycline feeding demonstrated the change that occurred from a predominantly sensitive to a predominantly resistant *Bact. coli* faecal flora.

3. A high proportion of tetracycline-resistant *Bact. coli* were found in the faeces of piglets whose mothers had been fed tetracyclines.

4. Tetracycline-resistant *Bact. coli* persisted for long periods of time in herds of pigs after tetracycline feeding had been discontinued.

5. A random survey of the sensitivity of the *Bact. coli* faecal flora of pigs, chickens, and sheep to oxytetracycline, streptomycin, sulphadimidine, and chloramphenicol indicated that a large proportion of the *Bact. coli* in the gut of many pigs were tetracycline-resistant. This is considered to be the result of the widespread use of pig food containing tetracyclines.

6. Diseases considered to be associated with *Bact. coli* were noted in herds of pigs in which tetracycline feeding had been practised. The *Bact. coli* isolated from such diseased animals were all tetracycline-resistant. These diseases were not uncommon in piglets weaned early on to a milk supplement containing oxytetracycline and whose mothers had been fed tetracycline-containing diets.

7. The significance of these observations is discussed.

Acknowledgments.—We are grateful to Dr. K. C. Sellers for his helpful advice and criticism. We wish also to thank the many other people who aided us in this work, particularly Mr. W. T. Nattrass of Messrs. J. and G. H. Matthews, Battles Bridge, Mr. A Harman, and Mr. L. J. Peacock.

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FOOT-AND-MOUTH DISEASE IN THE ARGENTINE

Argentine exporters say that the fears of bringing foot-and-mouth disease to this country in their meat are much overrated.

Their comments arise from reports that the N.F.U. is asking the Ministry of Agriculture to look into arrangements for inspection of exports before they are shipped to the United Kingdom.

" It is impossible for a diseased animal to pass through because there are three different inspections in addition to the supervision of the British representatives in Argentina," Mr. J. de D. Pisarello, London representative of the Junta Nacional de Carnes (Argentine Meat Board) has said.

Officials of the Argentine Ministry of Agriculture saw the animals on the *Estancias* before they left for the slaughterhouse. More officials saw them at the slaughterhouses before killing, and afterwards the carcases were officially examined for general fitness for export, quite apart from foot-and-mouth disease.

" The British official can see the meat at any stage," he added. " He usually sees the animals before they are killed and then inspects the carcases."

Mr. Pisarello denied that foot-and-mouth was widespread in his country.

Notes on the Use of Calcium Versenate in Acute Lead Poisoning

BY

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HOLM *et al.* (1953) carried out experiments on the treatment of acute lead poisoning in calves using calcium versenate. Of seven calves given lead acetate orally at the rate of 1 g. per 5 lb. bodyweight, and treated when marked central nervous system disturbances were manifest, four recovered and one of the deaths appeared to be not connected with the lead poisoning. The amounts of calcium versenate used varied, but were generally 5 g. to 15 g. daily for four to six days. The injections were given either subcutaneously or intravenously in glucose saline, and in four of the cases magnesium sulphate was administered orally on the first day of treatment.

Lewis & Meikle (1956) reported the successful use of calcium versenate in the treatment of two heifers in a field case of acute lead poisoning. Their initial treatment was 6 g. of calcium versenate in 500 ml. glucose saline, injected subcutaneously in one case, and in the other one quarter of the dose was given intravenously and the rest subcutaneously. Another similar dose was given to each animal intravenously three days later and recovery was rapid and uneventful. Concurrent use of ½ lb. doses of magnesium sulphate daily was stressed as an essential part of the treatment. The subcutaneous injection of calcium versenate caused great pain, but no signs of distress were displayed when given intravenously.

Through the co-operation of veterinary surgeons we have been able to study the field use of calcium versenate in three cases of lead poisoning. In each case the injection has been given intravenously as slowly as practicable, and the dose has been based on that used by Lewis and Meikle, *i.e.*, six g. of calcium versenate in 500 ml. saline for adult cattle and correspondingly less for smaller animals. Magnesium or other soluble sulphate was not used concurrently with the versenate treatment.

Case I

This involved a series of deaths in six- to nine-month-old calves. Chemical analysis of the liver and kidney of the second casualty showed lead concentrations well in excess of the toxic levels, thus confirming the veterinary surgeon's diagnosis of lead poisoning. A survey of the other cattle on the farm revealed blood levels in two animals above the normal limit of 0.25 mg. per ml. (Allcroft, 1951). One of these animals had been ill for some time but died shortly after treatment. The other developed typical symptoms of acute lead poisoning, and was treated with 3 g. calcium versenate intravenously in 250 ml. saline. Clinically the animal responded very rapidly, was eating normally within a few hours, and recovered completely without further treatment.

Later the same day a pet donkey, grazing with the cattle (but not included in the blood survey) developed clinical signs of lead poisoning. It also was treated with 3 g. calcium versenate intravenously and responded immediately. Recovery followed without further treatment.

Blindness was not a feature of this outbreak.

Case II

This case involved one bullock of a herd grazing on land adjoining that on which the cattle in Case I were grazing. The symptoms included depression, blindness, and partial paralysis of the tongue. The animal was unable to pick up grass but could chew and swallow grass pushed into the mouth as far as the molars. Analysis showed 250 p.p.m. lead in the dry matter of the faeces (normal up to 28 p.p.m.).

On the day following treatment with 6 g. calcium versenate intravenously there was marked clinical improvement, and the animal recovered, though sight did not return for a period of three to four days.

In neither of these two cases was it possible to trace the source of lead.

Case III

The third case involved a Friesian heifer, 18 months old, showing extreme nervousness, muscular twitchings, blindness, and the same type of paralysis of the tongue as noted in Case II. Treatment with a subcutaneous injection of calcium produced no response, and blood and faeces samples were submitted for analysis. Both had lead contents at the upper limit of the normal ranges.

Treatment with 6 g. calcium versenate intravenously produced an almost immediate response and the animal appeared more normal. Twenty-four hours later sight was partially restored and the animal could be hand-fed as described in Case II. After three days the heifer was feeding normally, though it was 10 days before sight was fully recovered.

Two possible sources of lead were found in the fields where the animal was grazing:—

1. A dump in one corner where empty paint tins and a quantity of red putty-like material which contained lead were found.

2. Pieces of the canvas covering of electric cables which had recently been erected. The canvas had been impregnated with a lead compound, probably white lead.

Discussion

The fact that four of these animals recovered after only one treatment with calcium versenate and without administration of soluble sulphate by mouth, may mean that they had not ingested massive doses of lead compounds. Holm *et al.* gave repeated doses of calcium versenate and Lewis & Meikle gave a second injection three days after the first.

For the sheep Blaxter (1950) found that the lethal dose of lead by vein is between 200 mg. and 400 mg. As the toxicity of lead for mature sheep and cattle is of the same order (Allcroft & Blaxter, 1950), the lethal dose by vein for the mature bovine animal would be approximately 5 g. to 10 g. Considering, for the purpose of calculation, that lead injected by vein is equivalent to lead absorbed, this means that sufficient calcium versenate must be injected to react with this amount of lead. As calcium versenate combines with roughly half its weight of lead, at least 10 g. to 20 g. would be required to combine with a lethal dose of lead. An initial treatment of 6 g. calcium versenate may, therefore, be effective if sub-lethal amounts of lead have been ingested, or may be sufficient to reduce the tissue concentration below the toxic level in cases where lethal amounts have been ingested. In these cases, however, further absorption from the gut may well raise the tissue concentration again to the level where toxic symptoms are manifest, or the animal may be left to get rid of relatively large quantities of lead by the normal processes of detoxication—which may take two or three months. It is, therefore, considered desirable to follow up the initial treatment with a second treatment after an interval of a few days.

Summary

Case histories of three outbreaks of lead poisoning are described. Calcium versenate treatment as described by Lewis & Meikle (1956) was found to be effective in four animals out of five.

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THE EGG MARKETING SCHEME

It is reported that intense activity prevails as the time draws near for poultry farmers to vote on this scheme as put forward by the three national farmers' unions of the United Kingdom. The scheme, having received Parliamentary sanction, still requires the approval of two-thirds of those poultry keepers having more than 50 birds six months old on January 25th. The farmers' unions, as sponsors of the scheme, are, naturally, doing their utmost, by various forms of propaganda, to ensure that the poultry industry accepts the scheme. The result of the voting is expected to be known early in April, the Ministry of Agriculture having appointed a partner in a firm of chartered accountants to act as returning officer. The new egg marketing board (assuming the vote is favourable) expect to begin their operations about mid-May.

A Note on the Isolation and Identification of *Vibrio fetus* from Cattle

BY

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FOLLOWING the work of Lawson & MacKinnon (1952), attention has been drawn to the widespread occurrence of bovine vibriosis in this country as shown by the vaginal mucus agglutination test and the isolation of the organism from aborted foetuses.

The isolation of *Vibrio fetus* from the bovine genital tract has, in the past, proved difficult, as the organism grows slowly and requires an enriched medium for growth. Culture plates tend, therefore, to be heavily overgrown with contaminating organisms. Furthermore, Bryner & Frank (1955) have shown that two groups of vibrios, morphologically and culturally similar, can be isolated from bovine genital tracts. These two groups differ biochemically and serologically. *V. fetus* is catalase positive and does not produce hydrogen sulphide. The non-pathogenic vibrios are catalase negative and produce abundant hydrogen sulphide. Serologically, there is no cross agglutination between strains of the two groups, but, within each group, considerable cross agglutination between strains occurs.

Therefore, in the diagnosis of *V. fetus* infection by the isolation of the organism, it is essential to show that the organism isolated is, in fact, *V. fetus*, and it is hoped that the following notes, based on work done in this laboratory, will serve to help in the isolation and identification of the organism.

Collection of Material for Culturing

Cows and Heifers

Mucus is collected from the anterior vagina by suction through a sterile, bent, glass tube connected to a glass mouthpiece by rubber tubing. A portion of each mucus sample is placed on three blood-agar plates with sterile scissors and spread over the surface of the agar with sterile glass spreaders. Uterine mucus and tissue are collected using a sterile biopsy instrument (Adler, 1952) and the material spread on one blood-agar plate. Uterine mucus can also be collected with a plastic insemination pipette.

Bulls

Swabs are taken of the preputial mucosa by cleaning the preputial opening and introducing a small vaginascope into the sheath. A sterile swab is then passed through the vaginascope and beyond it into the posterior part of the prepuce where it is massaged from the outside. The swabs are plated directly on three blood-agar plates.

Semen is collected in an artificial vagina and a drop from a Pasteur pipette placed on each of three blood-agar plates and spread with a sterile loop.

Cultivation of the organism

For primary isolation from all sources, the following medium has been used successfully:—

Water 1,000 ml.
Agar 25 g.
Evans peptone 10 g.
Lemco 10 g.
NaCl 5 g.
Sodium thioglycollate 1 g.
*p*H 7.6

After autoclaving at 121° C. for 15 minutes and cooling to 56° C., 10 per cent. defibrinated ox or sheep blood is added and thick plates poured. All plates are incubated at 37° C. in 10 per cent. CO_2 for six days. It is important to leave all plates for this length of time as, very often, plates not showing growth after three days' incubation show good growth after six days.

For maintaining pure cultures, Brewer's medium has been found to be the most satisfactory:—

Water 1,000 ml.
Evans peptone 10 g.
Lemco 10 g.
NaCl 5 g.
Dextrose 5 g.
Agar 5 g.
Sodium thioglycollate 1 g.
Methylene Blue (1 per cent.) 6 ml.
*p*H 7.2

This medium is dispensed in 40 ml. quantities in 100 ml. screw-capped bottles and autoclaved at 121° C. for 15 minutes. It is boiled and cooled just before use. Good growth is obtained following incubation for three days at 37° C. in air, and cultures remain viable for about four weeks.

Biochemical Tests

Catalase Test

One ml. of a three-day thioglycollate broth culture is mixed with 1 ml. 6 per cent. Analar hydrogen peroxide, in a test-tube, well shaken and left for 20 minutes. With catalase positive strains, marked frothing occurs. As hydrogen peroxide deteriorates with age, its potency must be checked periodically, using a *Staph. aureus*.

H_2S Production

A tube of lemco broth is inoculated with a heavy suspension from a blood-agar plate and a strip of lead acetate paper placed between the cotton-wool plug and tube. The tubes are incubated for 24 hours at 37° C. in 10 per cent. CO_2. A positive reaction is indicated by appreciable blackening of the lead acetate paper after 24 hours. Slight browning of the tip of the paper is considered to be a negative reaction.

Conclusions

In cows and heifers recently infected with vibriosis, *V. fetus* has been easily and frequently isolated from anterior vaginal mucus. Results with uterine biopsy material were not quite so successful. On primary isolation from these sources, heavy growth is often obtained either in the form of colonies up to 2 mm. in diameter, pearly grey in appearance, or as a grey spreading film. Pure cultures can easily be obtained from these although, on first subculture, growth is never profuse and consists of very small, grey shiny colonies.

From a proportion of heifers and cows, catalase negative vibrios can be isolated, growth often occurring as a grey film. The recovery rate of catalase-negative vibrio is never very high but the only certain means of distinguishing between them and *V. fetus* is by biochemical tests. Catalase-negative strains have, on a few occasions, been isolated from unmated heifers and frequently from heifers inseminated with semen of known *V. fetus*-negative bulls.

Catalase negative vibrios are commonly isolated from the sheath and semen of bulls. Colonies are about 2 to 3 mm. in diameter, circular, raised, flat, with a greenish tinge. The medium surrounding the colonies is often discoloured. Although *V. fetus* is found in the semen and sheath of infected bulls, no success has been obtained in isolating it from these sites.

Present experience indicates that the only reliable means of diagnosing the infection in bulls is by test mating on a vibrio-free heifer, culturing mucus from the anterior vagina, and submitting the isolated vibrio to biochemical tests.

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COMPULSORY SLAUGHTER OF PIGS

Regarding the slaughter of pigs in foot-and-mouth restricted areas, reference was made at the annual meeting of the Executive Committee of Worcestershire N.F.U., to hardship caused to producers in areas where no facilities exist for the slaughter of bacon pigs. It was agreed to ask N.F.U. headquarters to make representations to the Ministry to relax travel restrictions on the movement of bacon pigs out of a restricted area to the curers for immediate slaughter.

FOOD INSPECTION IN MANCHESTER AND LIVERPOOL

Manchester Corporation has transferred the functions relating to food inspection from the Markets Committee to the Health Committee. Staff transfers include one chief veterinary officer and three veterinary inspectors.

Liverpool Corporation has given authority for up to eight of the posts of meat inspector to be filled by assistant public health inspectors at Stanley abattoir. The subject will be reviewed not later than December 31st, 1957.

The Benjamin Ward Richardson Lecture—1956

THE Benjamin Ward Richardson lecture, on the subject Food Poisoning in Man, with special reference to Meat and Meat Products, was delivered by Professor R. Lovell, D.SC., PH.D., M.R.C.V.S., D.V.S.M., Professor of Veterinary Bacteriology, University of London, at a meeting held at the headquarters of the Royal Society of Health on Wednesday, November 28th, 1956. Professor Harold Burrow, M.R.C.V.S., D.V.S.M., Chairman of the Council of the Royal Society of Health, was in the Chair. We print the following abstract of Professor Lovell's paper by kind permission of the Society :—

Introduction

Primitive man acquired food by "gathering," while civilised man acquires food largely by "production." Changes in the habits of acquiring food are constantly taking place and accidents occur when people are adapting themselves to new conditions. Diseases are accidents and those associated with food and feeding vary in their frequency, intensity and causes, according to the habits of the people. Diseases are some of the side-effects which accompany progress.

The preservation of food was practised many years before the birth of Christ, though methods have changed since that time. In England, up to the end of the 18th century, very many live-stock were slaughtered in the autumn and the meat derived from them was preserved by salting ; but new methods of agriculture resulted in the greater production of winter feeding-stuffs, and the wholesale slaughter of stock each autumn ceased. The health of the people improved and scurvy and skin diseases decreased in frequency. Artificial refrigeration became a popular method of preserving meat towards the end of the 19th century.

More recently, the consumption of food by the family in the home has yielded to the mass preparation of food and its consumption in restaurants and canteens. Joints of meat and offal which are ready for the oven and wrapped in cellophane or encased in metal are for sale. Ice cream is now eaten all the year round whereas formerly it was a summer delicacy. Accidents and even catastrophes must be expected during any changes affecting the life and conditions under which people live. Outbreaks of food poisoning will continue to occur because new habits are being formed. New methods of food preservation are in use ; newer ones are envisaged ; none is proof against the occasional accident.

Aetiology and Extent of Food Poisoning

The name "food poisoning" is frequently restricted to those cases of acute gastro-intestinal disturbance associated with microbial infection of food or drink. The common bacterial species which may be involved include salmonella (especially *S. typhi-murium*), *Staphylococcus aureus*, *Clostridium welchii* and *Clostridium botulinum*. Secondary or subsidiary effects play an important part in the aetiology of the disease.

In England and Wales in 1954 there were 6,016 food poisoning incidents (*8,961 in 1955. Editor's note*) and although the methods of notification and recording have recently been improved, the statistical increase in food poisoning incidents over recent years is probably a real one.

There is no doubt that meat and meat products are the most frequent vehicles of infection in food poisoning. During the years 1950–4, meat and meat dishes were the vehicles of infection in 64 to 79 per cent. of those outbreaks about which information is available. In 1954, out of 197 outbreaks where a meat dish was implicated, fresh meat was concerned in only one, canned meat in 19, and re-heated meat or meat pies in 78 of the remaining 170. *S. typhi-murium* is known to be the most common of the infective agents in food poisoning in England and Wales. It was presumed to be the causal agent of 50 per cent. of all recorded incidents in 1954 and 40 per cent. or over in the preceding four years.

It is questionable whether food animals themselves are reservoirs of infection in any but a small number of outbreaks. The distribution of the types of salmonella in cattle is in marked contrast to that obtaining in food poisoning in man. *S. dublin* is commonly found in cattle, but is an uncommon cause of food poisoning. *S. typhi-murium* is rarely found in cattle, but is apparently more common in pigs.

Salmonella infection may be spread in slaughterhouses and food shops or kitchens, by dogs, cats, rats, mice, or even pigeons. A survey made in London a few years ago showed that two out of five strains of salmonella from 500 samples of dog faeces and three out of seven from 500 samples of cat faeces and of 3 from 133 samples of pigeon faeces were *S. typhi-murium*. It is well known that rats and mice may be infective, and the danysz and jena varieties of *S. enteritidis* which may be used for rodent destruction are pathogenic to man and animals.

There is little known about the incidence of salmonella in, or on, the actual carcases of animals passed as fit for human consumption. Some American figures are high, but figures were low in a survey made in six abattoirs in this country during 1950–6 ; the commonest salmonella isolated in this survey was *S. dublin*.

There is little doubt that salmonella food poisoning in man may be derived from the food animals themselves, especially when pork or pork dishes are vehicles, but infection of beef and beef products appears to occur more frequently after the meat has left the slaughterhouse. Meat or its products may be contaminated during slaughterhouse operations or afterwards, and mice, rats, even dogs and cats may be suspect ; more important, perhaps, is the human symptomless excreter. The mode of preparation of the meat or meat product at least aggravates the situation and fosters multiplication of bacteria in food poisoning due to salmonella organisms. The number of organisms consumed is important.

The modes of preparation of food are of clearer importance in outbreaks in which *C. welchii* is incriminated. Here the heat-resistant bacteria multiply during slow cooling of cooked meat without competition, as

heat-sensitive bacteria have been killed in the primary cooking.

Semi-preserved meats in sealed containers, such as canned hams, are not subjected to sufficient heat to kill all bacteria which may persist in spite of the *p*H, nitrate, nitrite, and salt content of the meat. Multiplication of clostridia, staphylococci and faecal streptococci may take place if the products are not stored at sufficiently low temperatures ; the organisms may have originated from food animals, food handlers, pickling brine, gelatine, or spices. Faecal streptococci are heat-resistant and will tolerate high acidity and salt concentration ; they are also facultative anaerobes. They have been isolated in large numbers from spoiled canned hams and can cause mild food poisoning. The bacteriological control of canned hams presents certain problems ; the water, cans, meat and spices all need special attention.

Botulism is fortunately rare in this country. Spores of *C. botulinum* are distributed in the soil and a large variety of foods may become vehicles of the specific toxin. Initial contamination may be small, but under suitable conditions the spores germinate and the bacteria multiply. Protection against botulism from canned foods is ensured if they are sufficiently heated to destroy the spores of *C. botulinum*.

Large numbers of *Staphylococcus aureus* may be transferred to food from the noses or from septic skin lesions of food handlers. Under suitable conditions organisms multiply and a heat-resistant toxin is formed which is capable of creating violent reactions if consumed by human beings. Similar staphylococci may cause mastitis in recently calved cows.

The common living agents responsible for food poisoning to-day are widespread in nature. Whatever their origin there is one common circumstance in outbreaks : an opportunity is given whereby an organism may multiply in sufficient numbers to produce a toxin of sufficient potency to affect the consumer of the food. The general rules of prevention are : scrupulous domestic and personal cleanliness and the avoidance, if possible, of made-up meat dishes. It is more important to have a strict code for the production of food, and to see that it is properly carried out, than to rely on bacteriological sampling of the finished product.

Future Considerations

It is necessary to attempt to visualise the immediate future and, if possible, anticipate future changes. Agriculture is changing and new methods in animal breeding may affect food consumers. We have witnessed great changes in the distribution and processing of our milk supply ; our meat supply may be equally altered.

Antibiotics and sex-hormones are being increasingly used for nutritional and therapeutic purposes on our food animals. What effect will this have ? The gut wall of animals fed with antibiotic is thinner than normal and the bacterial flora of the intestines altered. The face of infectious diseases is also changing, because of the select action of antibiotic therapy. There is thus a revolution in the relationship of our live-stock and their microbial flora. This may be to our benefit or disadvantage : advances have to be paid for, and an increase and greater variety of microbial food poisoning may be included in the account.

Current Literature

ABSTRACTS

The Survival Time of *Mycobacterium paratuberculosis*. LARSEN, A. B., MERKAL, R. S., & VARDAMAN, T. H. (1956). *Am. J. Vet. Res.* **17.** 549-51.

Cultures of the Johne's bacillus *Mycobacterium paratuberculosis* survived for less than 30 days when mixed with bovine urine or with faeces and urine. The organism survived for 17 to 19 months in tap water and for 47 months in a desiccator. Survival was longest when the organisms were kept free of urine and faeces in a darkened place. They were killed by 65 to 100 hours' exposure to sunlight.

Q Fever in South Wales. EVANS, A. D. (1956). *Mon. Bull. Minist. Hlth Lab. Serv.* **15.** 215-9.

The author states that 65 out of 1,311 (5 per cent.) samples of raw milk submitted from individual herds in South Wales for routine examination for the presence of tubercle bacilli were found to be infected with *Rickettsia burneti* as judged by the production of specific complement-fixing antibodies in inoculated guinea-pigs. Fifty-two out of 136 (38 per cent.) samples of bulked raw milk collected from retailers gave positive results as did 6 out of 110 (5.5 per cent.) samples of milk pasteurised by the high-temperature-short-time method. Fifty-two out of 1,954 (2.7 per cent.) samples of sheep sera collected from flocks in Glamorgan and Monmouthshire showed significant titres of complement-fixing antibodies for Q fever. as did 4.1 per cent. of 1,202 samples of human sera from blood donors from various parts of South Wales.

Although these figures indicate a wide distribution of *R. burneti* in both the human and animal population of this area, clinically recognisable cases of Q fever are uncommon. Thus, in an investigation of 2,482 consecutive cases of non-bacterial pneumonia, only 15 cases appeared to be caused by *R. burneti*.

Effects of Infectious Bronchitis in Baby Chicks. BROADFOOT, D. I., POMERY, B. S., & SMITH, W. M., JR. (1956). *Poult. Sci.* **35.** 757-62.

The authors state that flocks that have been affected with infectious bronchitis at an early age (*e.g.* three days to three weeks) may subsequently fail to reach a satisfactory rate of lay. Thus, 35 flocks affected in this way gave egg yields of only 35 to 65 per cent. The non-laying birds had every appearance of normal layers, and visited the nest regularly. *Post-mortem* examination showed that their oviducts were short and often non-patent. The ovaries were active, but the ova were deposited into the body cavity, giving rise to concretions of yolk material.

The condition was produced experimentally by exposing chicks to infection with a field strain of infectious bronchitis virus. The effect was greatest in chicks exposed at one and four days of age. The oviduct abnormalities included lack of patency and the presence of cysts in the walls or supporting ligaments.

E. A. G.

Legal Pitfalls of Veterinary Practice

BY

CHARLES STEVENS

III.—THIRD PARTY LIABILITY

IT is obvious to the veterinary surgeon that he has a legal responsibility opposite his clients, but he is not always aware of the legal obligations he has to third parties, although in recent years by reason of his car insurance he has knowledge of the existence of third party liability. Under English law a man normally is held to be responsible for any damage arising from his actions whether the damage be contemplated or not, provided it does not arise from an inevitable accident.

In one instance a veterinary surgeon was destroying a dog with a humane killer and unfortunately the bullet hit and injured a bystander. The third party, the bystander, would expect to obtain damages from the veterinary surgeon, whose liability would be decided on a question of accident or possible negligence. It is safe to say that, in such a case, if all reasonable precautions are taken no liability would attach because at the end of the 19th century there was decided the leading case of Stanley *v.* Powell. In this case Powell was a member of a shooting party who fired at a pheasant, but the missile struck the bough of a tree and then wounded Stanley who was carrying cartridges for the shooting party. Although Stanley sued Powell the latter was held not liable because there was no negligence and the harm occasioned was entirely accidental and beyond the control of the average man. This decision was confirmed as recently as 1951 in the Court of Appeal in a similar type of case. It would appear, therefore, that the third party in the case of the injured bystander, mentioned above, would have no action against the veterinary surgeon.

Contrasting with this, however, is the case where a dog was boarded with a veterinary surgeon, and during the time it was in his care it escaped. While free the dog knocked a child off a bicycle and this was the immediate cause of a car crash. Here the veterinary surgeon's liability to third parties, that is the child on the bicycle and those involved in the car crash, is obvious. Their damage had clearly resulted from the negligent act of the veterinary surgeon in permitting the dog boarded with him to escape.

It will be seen, therefore, that the liability to third parties does in the ultimate depend on the degree of care exercised by the veterinary surgeon. In addition to carrying adequate third party protection, either by insurance or through the Mutual Defence Society, he should ensure that on all occasions he takes adequate precautions.

It is common practice for a stockman or a farmer to be asked to assist the veterinary surgeon when treating animals, or administering an anaesthetic, by securing them. In such cases the veterinary surgeon should give clear instructions to the person assisting him as he is carrying out professional work which is his clear responsibility. Any suggestion from the assistant that he is used to the work and should be allowed to assist in his own way must be firmly repudiated, as this would be no real defence if damage arose to the person concerned.

One claim made on the Mutual Defence Society arose out of a de-horning incident, when the stock-owner offered to assist the veterinary surgeon and stated he had assisted in this operation before and knew how to hold the animal concerned. The veterinary surgeon was wise, however, and refused to accept the stock-owner's statement and gave the most clear instructions as to how the assistance should be rendered. Through no one's fault the animal kicked out and injured the stock-owner; but because of the wisdom of the veterinary surgeon no legal claim lay against him.

In addition to liability to third parties, the veterinary surgeon may consider occasionally that he himself has a claim against a third party when claims are made upon him. He may consider that the instruments or the products he has used or prescribed have not been up to standard and that the claim against him may be passed on to a third party in the person of the supplier. The veterinary surgeon should not take too much comfort from such a right as in most cases it is of little value. It is rare indeed that drugs and instruments are below standard, and it is always difficult to prove either that they are, or even if they are, that they are the real cause of damage.

It was mentioned in the first article in this series that the veterinary surgeon is a professional man with a statutory qualification, and he is therefore expected to assess what is required for the treatment of his animals and to use his professional judgment in the selection of drugs and remedies. It is rarely the case that the Courts would permit him to throw this responsibility on to third parties.

FOOT-AND-MOUTH DISEASE IN 1956

There were 162 outbreaks of foot-and-mouth disease last year, and the amount of compensation paid was more than £750,000. With the exception of 1952, when there were 495 outbreaks, this makes 1956 the worst year since the war. Stock slaughtered included 10,547 cattle, 13,133 sheep, and 4,813 pigs.

Among other notifiable diseases during the year there were 741 outbreaks of swine fever, and some 1,200 outbreaks each of anthrax and of fowl pest.

Copper Poisoning in the Pig

BY

W. A. M. GORDON and D. LUKE

The Farm, Stormont, Belfast

PREPARATIONS containing copper are now used for a variety of purposes in agricultural practice: *viz.* orchard sprays, in the control of liver fluke host snails, as an anthelmintic and, more recently, as an addition to calf and pig meals. Records of copper poisoning in stock have appeared from time to time in recent years in veterinary literature and most of these refer to sheep which, in the normal course of events, have hitherto been the farm animal most exposed to the toxic hazards of this element (Ogilvie, 1954; Clegg, 1956). In the literature consulted no records of copper poisoning in pigs were found.

Recently the carcase of a bacon-weight pig was sent to the laboratory for *post-mortem* examination. A generalised icterus was found, all the organs and tissues being stained an intense yellow colour. The spleen was enlarged and the pulp almost black; the liver was coloured orange-yellow, the kidneys were much enlarged, and the cortex was studded with large, dark haemorrhagic areas. The bladder contained a small quantity of blood-stained urine.

Bacteriological examination was negative and on the basis of a liver copper content of 2,500 p.p.m. a diagnosis of copper poisoning was made.

On the farm in question a pig had died about a week previously from generalised icterus. Three pigs in a second pen became involved with an apparently similar condition, one of these died and its carcase is referred to above. The first abnormality noticed by the owner was a progressive yellowing of the skin. The temperature in the early stages was normal and appetite was maintained. As the icterus developed the appetite was lost and affected pigs developed an unsteady gait. There were frequent attempts made to micturate but only small quantities of dark red or almost black urine were passed. Constipation was marked. In the later stages temperatures up to 106° F. were recorded. Three out of the four pigs affected died after an illness lasting three days. The fourth pig was submitted to a bacon factory but the carcase was condemned for generalised jaundice.

Liver specimens from two pigs belonging to different owners were submitted here for examination from a local bacon factory, where the carcases in question had been condemned for generalised jaundice. The copper content of these livers was 2,450 and 2,160 p.p.m. respectively.

Discussion

There has been a growing tendency in recent years in Northern Ireland for copper sulphate to be added to pig meal in the hope of controlling certain types of scouring. In addition, evidence has been published which suggests that the addition of copper at the rate of 250 p.p.m. to the ration improves the growth rate in pigs (Barber *et al.*, 1955). One result of all this has been that some meal compounders are adding to pig meals copper sulphate at the rate of ½ to 1 lb. per ton as part of the mineral supplement (roughly equivalent to 50 to 100 p.p.m. of copper). It cannot be emphasised sufficiently that copper sulphate can be a dangerous poison and that little is known concerning its absorption, retention, and excretion in farm animals, especially when fed for several months at the levels mentioned above. Experimental work reported by Mahoney *et al.* (1955) suggests that pigs have only a limited ability to excrete copper.

In the adult pig about 40 p.p.m. of copper in the liver may be regarded as normal (Cunningham, 1931). In "infant pigs" the same author found a range of variation in the liver copper content of 50 to 465 p.p.m. In the sheep it is considered that liver values of more than 500 p.p.m. represent an abnormal intake (Albiston, 1940). We have carried out a few liver copper estimations on a farm where copper sulphate was being fed at the rate of 1 lb. per ton of meal (100 p.p.m. of copper). The liver sample from four sows gave a mean value of 103 p.p.m. with a range of 38 to 170. Livers from four bacon pigs gave a mean value of 99 p.p.m. with a range of 54 to 159. In 22 full-term foetuses the mean value was 121 p.p.m. and the range 35 to 264. Even in the few adult samples examined it is evident that there is considerable variation in the ability of different pigs on the same level of intake to store copper. This inference presupposes that mixing of the copper sulphate in the meal is thorough and adequate, and McGirr (1956) has drawn attention to the fact that uniform mixing of this chemical in meal is not easy. It was not possible in the present instances to ascertain the exact amount of copper being fed but it is known that on two of the three farms the meal was supplemented with copper sulphate.

Acknowledgments.—We wish to thank Mr. R. Kirkpatrick, M.R.C.V.S., and Mr. J. E. C. Stuart, M.R.C.V.S., for supplying the clinical material, and Mr. J. Todd, M.AGR., and Miss S. Baird for carrying out the liver analysis.

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News and Comment

THE R.S.H. CONGRESS

As announced already in these columns the annual congress of the Royal Society of Health will take place at Folkestone from April 30th to May 3rd. The preliminary programme includes a number of items of interest to members of the profession. In the veterinary hygiene section (May 1st), of which Professor L. P. Pugh is President, there will be, in addition to his own Address, a paper on "The Production and Handling of Meat in Australia and New Zealand" by Mr. L. N. Thornton, B.V.SC., M.R.C.V.S., senior Government trade commissioner for Australia in London, and Mr. C. V. Dayus, M.R.C.V.S., New Zealand agricultural adviser in London. The other paper in this Section will be "The Fish Industry in Great Britain" by Mr. Kenneth P. Keywood, chief inspector, The Fishmongers' Company.

Of interest from other sections of the Congress will be "Food Hygiene, What Progress" (May 2nd) by Mr. L. H. Vale, chief public health inspector, Folkestone; "World Nutrition" (May 2nd) by Dr. Cicely D. Williams, senior lecturer in nutrition, London School of Hygiene and Tropical Medicine; and on the following day "Rabies in India" by Lt.-Col. Mohan Lai Ahuja, medical adviser to the High Commissioner for India.

SIR IAN CLUNIES-ROSS

The Council of the Royal Agricultural Society of England has awarded the society's gold medal to Sir Ian Clunies-Ross, of Deepdene, Melbourne, Australia, for outstanding services to agriculture in Australia. Coupled with the award is honorary membership of the society. The medal is given for distinguished services to agriculture, and this is the first to go to an Australian scientist. Sir Ian is chairman of the Commonwealth Scientific and Industrial Research Organisation and a former Professor of Veterinary Science at Sydney University. He was one of three Australian scientists who submitted themselves to inoculation with myxomatosis in 1951 to prove that the disease could not affect human beings.

UNIVERSITY NEWS

Liverpool

Mr. H. Harding, M.R.C.V.S., lecturer in pathology at the Veterinary School, left this country on December 28th to take up his appointment as Senior Lecturer in Veterinary Science in the University College of the Gold Coast, at Achimota.

THE SOUTH AFRICAN UNIVERSITIES' FIFTEEN

Readers will learn with interest that the captain of the combined South African Universities' rugby side at present touring Britain is B. D. Pfaff, the son of Colonel George Pfaff, O.B.E., veterinary surgeon of Johannesburg. The South African team meets Oxford on February 2nd, Cambridge on February 14th, and London on February 16th.

THE REGISTER OF VETERINARY SURGEONS

Under the provisions of Sec. 13 (1) of the Veterinary Surgeons Act, 1881, Mr. Ponambalam Jeganathan, B.V.SC. (SYDNEY), Department of Agriculture, Ceylon, was admitted to the Commonwealth and Colonial List on January 4th.

Under Section 25 (3) of the Veterinary Surgeons Act, 1948, and the provisions of Statutory Instrument No. 1150 of 1953, the name of Mr. Nahum Firun, Nathanya, Israel, was removed from the Register of Veterinary Surgeons on January 1st, 1957.

PERSONAL

Births

BASINGER.—On January 5th, 1957, to Sylvia, wife of Donald Basinger, M.R.C.V.S., Animal Health Division, Chelmsford, a son, Carl Lewis.

BRADLEY.—On January 4th, 1957, to Jean, wife of Howard Bradley, B.V.SC., M.R.C.V.S., 2, Coverdale Avenue, Bolton, a daughter, Pamela Fiona, a sister for Susan.

DUGUID.—On December 20th, 1956, to Elizabeth, wife of Ian M. Duguid, B.SC., M.R.C.V.S., 3, North Parade, Lincoln, a daughter.

MEREDITH.—On December 31st, 1956, to Wendy, wife of Keith Meredith, B.V.SC., M.R.C.V.S., at Sandringham, Ross-on-Wye, a daughter, Gay, sister for Howard.

MOORS.—On December 10th, 1956, to Betty, wife of Wm. M. Moors, M.R.C.V.S., 26, Princes Street, Southport, a son.

RICHARDSON.—On December 23rd, 1956, to Bridget, wife of R. Richardson, B.SC., M.R.C.V.S., 91, Newbold Road, Chesterfield, a daughter, Elizabeth Anne.

Marriages

MACKAY—HENDRY.—On December 21st, 1956, at Kingstone Presbyterian Church, Surrey, Richard Ross MacKay, M.R.C.V.S., B.V.M.S., D.V.S.M., of Denny, Stirlingshire, Scotland, to Elizabeth Hendry of Nitshill, Glasgow.

YEATS—WHITE.—The marriage took place at Christchurch, Downard, Bristol, on December 15th, 1956, between James John Yeats, M.R.C.V.S., of Woodbank, Rowton, Chester, and Kathleen Sheila White, M.R.C.V.S., of The Grove, Pluckley, Ashford, Kent.

R.C.V.S. OBITUARY

We record with regret the death of the following members of the profession:—

BURRELL, Horace, 115, Addington Road, Selsdon, Surrey, Capt. R.A.V.C. (T.F.) (Retd.). Graduated London, December 17th, 1900. Died in November, 1956.

RYAN, Cornelius Butler, Ballyslattern House, Golden, Cashel, Co. Tipperary, Eire. Graduated Dublin, July 17th, 1916. Died September 9th, 1956, aged 65 years.

COMING EVENTS

January

17th (Thurs.). Meeting of the Essex Veterinary Society at the Essex Institute of Agriculture, Writtle, Nr. Chelmsford, 7.30 p.m.

24th (Thurs.). Annual Dinner and Dance of the V.V.B.F. (Northern Division) in the Northern Hotel, Aberdeen, 7.30 p.m.

30th (Wed.). General Meeting of the Lancashire Veterinary Association at the Midland Hotel, Manchester, 2.30 p.m.

Ordinary General Meeting of the Sussex Veterinary Society at the Old Ship Hotel, Brighton, 2.30 p.m.

February

1st (Fri.). Annual General Meeting of the Mid-West Veterinary Association at the Berkeley Café, 2.30 p.m.

6th (Wed.). General Meeting of the Ayrshire Veterinary Association in the Hotel Dalblair, Ayr, 2.30 p.m.

7th (Thurs.). General Meeting of the Central Veterinary Society at the Royal Veterinary College, Camden Town, London, N.W.1, 6 p.m.

13th (Wed.). General Meeting of the Society of Practising Veterinary Surgeons at the Royal Veterinary College, Camden Town, N.W.1, 2.30 p.m.

19th (Tues.). 81st Annual General Meeting of the Eastern Counties Veterinary Society at the Bell Hotel, Norwich, 11.15 a.m.

21st (Thurs.). Annual Ball of the Royal (Dick) School of Veterinary Studies in the Assembly Rooms, George Street, Edinburgh, 8.30 p.m.

BRITISH VETERINARY ASSOCIATION QUARTERLY MEETINGS

Wednesday, January 23rd, 1957, at 7, Mansfield Street, W.1.

10.00 a.m. Parliamentary and Public Relations Committee.
11.30 a.m. Veterinary State Medicine Committee.
2.00 p.m. Small-Animals Committee.

Thursday, January 24th, 1957, at 7, Mansfield Street, W.1.

10.00 a.m. Farm Live-stock Committee.
11.30 a.m. Home Appointments Committee.
12.30 p.m. Finance Sub-committee.
2.30 p.m. General Purposes and Finance Committee.

Friday, January 25th, 1957, Connaught Rooms, Great Queen Street, W.C.2.

10.30 a.m. Extraordinary General Meeting followed by Council Meeting.

FOOT-AND-MOUTH DISEASE

The area described in the schedule below is declared to be an Infected Area for the purpose of preventing the spread of foot-and-mouth disease:—

The City and County Borough of Canterbury.

IN THE COUNTY OF KENT

The Boroughs of Deal, Dover, Folkestone and Sandwich.

The Petty Sessional Division of Wingham and Sandwich.

In the Petty Sessional Division of St. Augustine: The parishes of Bokesbourne, Patrixbourne, Bridge, Lower Hardres and Upper Hardres.

In the Petty Sessional Division of Hythe and Romney Marsh: The parishes of Stelling, Elham, Acrise, Paddlesworth, Newington and Hawkinge.

IN THE COUNTY OF GLOUCESTER

The Petty Sessional Division of Fairford.

In the Petty Sessional Division of Stow on the Wold: The parishes of Swell, Donnington, Broadwell, Adlestrop, Stow on the Wold, Oddington, Bledington, Maugersbury, Icomb, Upper Slaughter, Naunton, Notgrove, Lower Slaughter, Wick Rissington, Westcote, Little Rissington, Great Rissington, Bourton on the Water and Clapton.

In the Petty Sessional Division of Winchcomb: The parishes of Temple Guiting, Guiting Power and Hawling.

In the Petty Sessional Division of Northleach: The parishes of Withington, Shipton, Andoversford, Hazelton, Compton Abdale, Turkdean, Yangworth, Hampnett, Northleach with Eastington, Farmington, Coln St. Dennis, Sherborne, Aldsworth, Windrush, Aston Blank and Barrington and so much of the parishes of Sevenhampton and Whittington as lies to the east of the road running from Charlton Abbots *via* Sevenhampton and Whittington to Dowdeswell including the said road.

In the Petty Sessional Division of Cirencester: The parishes of Rendcomb, Chedworth, Winson, Barnsley, Ampney Crucis, Down Ampney, Ampney St. Mary and Ampney St. Peter and so much of the parishes of North Cerney and Baunton as lies to the east of the main road (A.435) running from Cheltenham to Cirencester including the said road.

IN THE COUNTY OF OXFORD

In the Petty Sessional Division of Chipping Norton: The parishes of Kingham, Idbury, Fifield, Bruern, Milton under Wychwood, Shipton under Wychwood, Ascott under Wychwood and Lyneham and so much of the parishes of Churchill and Sarsden as lies to the south and west of the road running from Kingham *via* Churchill to Chadlington including the said road.

In the Petty Sessional Division of Bampton West: The parishes of Taynton, Fulbrook, Swinbrook and Widford, Asthal, Burford and Upton and Signet, Shilton, Westwell, Holwell, Brize Norton, Filkins and Broughton Poggs, Broadwell, Kencott, Alvescot, Black Bourton, Leafield, Langford, Little Faringdon and Kelmscot.

In the Petty Sessional Division of Bampton East: The parish of Minster Lovell.

IN THE COUNTY OF WILTS

The Borough of Swindon.

The Petty Sessional Division of Swindon.

In the Petty Sessional Division of Cricklade: The parishes of Marston Meysey, Latton, Lydiard Tregoze, Wootton Bassett and Broad Town and so much of the parishes of Ashton Keynes, Leigh, Cricklade, Braydon, Purton and Lydiard Millicent as lies to the east of the road running from Cirencester *via* Ashton Keynes to Wootton Bassett including the said road.

In the Petty Sessional Division of Marlborough: The parish of Broad Hinton.

The areas described in the schedules below will cease to be Infected Areas for the purpose of preventing the spread of foot-and-mouth disease on January 13th and January 15th, 1957, respectively:—

IN THE COUNTY OF WILTS

The Borough of Malmesbury.

In the Petty Sessional Division of Malmesbury: The parishes of Crudwell, Oaksey, Minety, Hankerton, Charlton and Lea and Cleverton and so much of the parishes of Brokenborough, St. Paul Malmesbury Without and Brinkworth, as lies to the north and east of the road running from Tetbury *via* Malmesbury and Brinkworth to Wootton Bassett including the said road.

In the Petty Sessional Division of Cricklade: So much of the parishes of Ashton Keynes, Leigh, Cricklade, Braydon, Purton and Lydiard Millicent as lies to the west of the road running from Cirencester *via* Ashton Keynes to Wootton Bassett excluding the said road.

IN THE COUNTY OF GLOUCESTER

In the Petty Sessional Division of Tetbury: The parish of Ashley and so much of the parish of Long Newnton as lies to the east of the road running from Malmesbury *via* Long Newnton to Trouble House Inn including the said road.

In the Petty Sessional Division of Cirencester: The parishes of Rodmarton, Kemble, Poole Keynes and Somerford Keynes.

IN THE COUNTY OF GLOUCESTER

The Petty Sessional Division of Berkeley.

In the Petty Sessional Division of Wotton under Edge: The parish of North Nibley.

In the Petty Sessional Division of Dursley: The parishes of Slimbridge, Coaley, Cam, Stinchcombe and Dursley.

In the Petty Sessional Division of Whitminster: The parishes of Frampton-on-Severn and Frocester.

ADDRESSES OF DISEASE INFECTED PREMISES

The list given below indicates, first the county in which are situated the premises on which disease has been confirmed, followed by the postal address and date of outbreak.

Anthrax

Anglesey. Plas Bodafon Farm, Llanerchymedd (Dec. 31).

Ches. Brown Heath Farm, Waverton (Jan. 2).

Essex. Brickwall Farm, Stisted, Braintree (Dec. 28).

Kirkcudbright. Leaths Farm, Castle Douglas (Jan. 3).

Lancs. Brook Farm, Hough Lane, Alderley Edge, Manchester (Dec. 28); Croxteth Home Farm, Croxteth, Liverpool, 12 (Dec. 31).

Renfrew. Burnside Farm, Kilmacolm (Dec. 31).

Salop. Red House, Little Ness, Shrewsbury (Dec. 31).

Staffs. Leigh Bank, Tean, Stoke-on-Trent (Dec. 28).

Warwicks. Manor Farm, Pebworth, Stratford-on-Avon (Dec. 28).

Fowl Pest

Herts. Ashwell End Farm, Ashwell, Baldock; Downs Farm, Royston Road, Baldock (Dec. 31); West Dene, Royston Road, Baldock (Jan. 1).

Lancs. Woodlands, Grange Lane, Hutton; Ashes Farm, Whitechapel, Goosnargh; Fellside, Whitechapel; Carr Lane Nurseries, Tarleton (Dec. 30); Hillocks Farm, Croston, Preston; Bezzabrook Nurseries, Salmesbury; Poultry Farm, Sandy Lane, St. Michaels on Wyre, Preston; Department of Husbandry, Lindle Lane, Hutton (Dec. 31); Bay Tree Farm, Greavestown Lane, Lea; Ratten Cottage, Ratten Lane and Knowle Farm, Ratten Lane, Hutton; Hallforth Hall Farm, Woodplumpton (Jan. 1); Elmwood, Copp Lane, Elswick; Manor House Farm, Croston Road, Farington; Kelvin Farm, High Furlong, Blackpool Old Road, Carleton, Blackpool; Back Lane Farm, Sowerby, St. Michaels-on-Wyre; Gradwell Farm, Ridley Lane, Croston (Jan. 2); 258, Slater Lane, Leyland; The Bungalow, Taylors Farm, Chapel Lane, New Longton; 2, Ash Lea, St. Michaels Road, Bilsborough; Millbrook, Townley Lane, Howick Cross, Penwortham; South Planks, Barton (Jan. 3).

Warwicks. Chapel House, Sheepy Magna, Atherstone (Jan. 3).

Swine Fever

Berks. Farfield, Weston, Newbury (Dec. 31); Sheepstead House, Marcham, Abingdon (Jan. 2).

Bucks. Ways Farm, Seven Hills Road, Iver Heath (Dec. 31).

Cambs. St. Johns College, Kitchen Gardens, Madingley Road, Cambridge (Jan. 3).

Essex. Calvers Farm, Dunton Road, Laindon, Basildon (Dec. 31).

Devon. Westhill Farm, Bampton, Tiverton (Jan. 3).

Hants. Newlyns Farm, Upham, Southampton (Dec. 31); Deepdene, Dibden, Southampton (Jan. 2); Verona, Granada Road, Hedge End, Southampton (Jan. 4); Hyde Farm, Damerham, Foldingbridge (Jan. 7).

Norfolk. The Mead, Horstead Hall, Horstead, Norwich (Jan. 2); Piggeries at Church Lane, Horsford, Norwich (Jan. 7).

Oxford. Holly Tree Farm, Kidmore End (Dec. 31).

Staffs. Bushbury Hall Farm, Bushbury, Wolverhampton; 23, Salop Street, Bradley, Bilston (Dec. 31); 82, Smallholding, Drayton Lane End, Satton Road, Drayton Bassett, Tamworth (Jan. 2); Coton Hall Farm, Tamworth; Hill Farm, Drayton Bassett, Tamworth; 138, Dalkeith Street, Walsall; Brookhouse Farm, Doxey (Jan. 7).

Suffolk. Bardwell Hall, Bardwell, Bury St. Edmunds (Jan. 3).

Surrey. Winkworth Gravel Pit Piggeries, Egham (Jan. 3); Grove Farm, Mytchett Road, Mytchett (Jan. 7).

Warwicks. Fairview Farm, Balls Lane, Wishaw, Birmingham (Jan. 7).

Wilts. Marymere Farm, Shalbourne, Marlborough (Jan. 1).

Yorks. Woodhouse Hall Farm, Woodhouse Lane, East Ardsley, Wakefield (Jan. 3).

CORRESPONDENCE

The views expressed in letters addressed to the Editor represent the personal opinions of the writer only and their publication does not imply endorsement by the B.V.A.

A Therapeutic Index

Sir,—May I draw the attention of your readers, especially those directly associated with the veterinary divisions of drug manufacturing companies, to the suggestion made by Dr. J. D. W. Whitney in his letter in *The British Medical Journal* of November 10th, 1956, p. 1,116.

For the mutual benefit of drug manufacturers and medical practitioners Dr. Whitney suggests that, in place of the present somewhat indiscriminate issue of advertising pamphlets, all drug manufacturing houses should issue a series of index cards of agreed standard size and pattern, each setting out the nature and uses of one of their various drugs and preparations. If an adequate number of cross-reference

cards were included in the series, practitioners could, by storing the cards in a simple index box, provide themselves with not only a comprehensive list of available preparations, but also an up-to-date therapeutic index.

That such a scheme commends itself to at least some of the manufacturing houses is indicated by a letter from Mr. A. Duckworth, Secretary of the Association of British Pharmaceutical Industry, published in *The British Medical Journal* of November 24th, 1956, p. 1,238, in reply to Dr. Whitney's suggestion.

I would therefore suggest that if such a scheme were widely adopted in the medical field it could, with great advantage, be extended to the veterinary field also, serving to reduce both manufacturers' advertising costs, and the volume of superfluous literature delivered daily to practitioners.

Yours faithfully,

M. C. G. LITTLEWORT.

Department of Veterinary Clinical Studies,
School of Veterinary Medicine,
Madingley Road,
Cambridge.

December 31st, 1956.

Virus Pneumonia of Pigs

Sir,—I imagine that the suggestion by Betts (*Vet. Rec.* **64.** 283) that "virus pneumonia of pigs" should be reduced to the formula "V.P.P." has led your contributor, Mr. R. Jones Pugh (*Vet. Rec.* **68.** 1,048), to re-expand the title to "virus pleuropneumonia." This is understandable, for even the offices of the Bannockshire Bakery Company are now and then confused with Broadcasting House. However, the mistake should be corrected because pleurisy is *not* a feature of this disease in cases uncomplicated by secondary bacteria.

Yours faithfully,

I. H. PATTISON.

Agricultural Research Council,
Field Station,
Compton,
Near Newbury,
Berkshire.

December 31st, 1956.

Adrian Jones, M.V.O.

Sir,—Many other Victorians will be transported back to the "horse-age" by reading the article about this distinguished member of our profession.

He was a great autocrat, for the sculptor had been first a soldier; and there is an underlying influence of this background in his works.

The writer had the good fortune to see, at Burlington House in 1912, a painting of a horse, with rider up, by Adrian Jones. Here was depicted an ideal charger. One could imagine that the eye of the inspecting officer had just passed by, and very much approved both horse and rider. No wonder King Edward VII chose Adrian Jones to perpetuate, in the gardens at Sandringham, his horse "Persimmon." When the finished work was erected His Majesty was heard to remark: "Just the place for 'Persimmon,' the money he earned for me helped to build my greenhouses."

Future generations will appreciate this British sculptor *par excellence*, yet how many will remember he was a veterinary surgeon? In what an age of mental tranquillity he lived! The noise of hooves upon the stable yard, the clatter of the squadron of cavalry, the glitter of their spotless accoutrements—there was pride in living then.

Yours faithfully,

IVOR HUGHES.

50, High Street,
Coleshill,
Warwickshire.

January 1st, 1957.

Acid Firing

Sir,—Having used acid firing for 25 years I was very interested in the article by Brigadier Peatt published in THE VETERINARY RECORD of December 22nd; but why make such a laborious and complicated business of what should be a simple operation?

All that is required is the acid, several corks, rubber gloves, and reasonable care. I groove the end of the cork with a razor blade. Having clipped the legs, or leg, application is easy. I agree with Brigadier Peatt: apply the acid fairly lightly to each spot and then repeat using more pressure. With a little experience one soon learns to apply the acid quickly and with safety.

Apart from having the opposite foreleg held up I have never used any form of restraint, and strongly deprecate the use of a twitch. In the handling of well-bred horses the less restraint the better.

In addition to using acid firing for the treatment of sprained tendon I have also used it with success for curbs. The advantages are: simplicity, successfulness except in the odd case, the fact that tendons seem to become extraordinarily fine after treatment, and no restraint is necessary.

Among many horses I have treated is a T.B. hunter owned by my Joint-Master, Sir Peter Farquhar; I fired this horse for a bow tendon and curbs seven years ago and he has been hard hunted ever since.

Yours faithfully,

E. F. BECKETT.

Berkeley Lodge,
Blandford,
Dorset.

December 26th, 1956.

Horning during Lairage

Sir,—I recently saw in a local slaughter house the carcase of a Friesian cow about six years old which had just been slaughtered. Although apparently quite normal *ante mortem*, upon removal of the hide an area of severe laceration and bruising was observed low down in the right flank which had presumably been caused by severe horning during lairage. There were about 12 holes in the musculature, some of

which had completely penetrated the external oblique muscle and associated fascia; in particular two of these wounds which would admit one's entire thumb had penetrated about half-way through the internal oblique. There was very little haemorrhage, which appeared surprising in view of the great damage which had been done to an area about 18 inches in diameter. The interesting aspect of this lesion was the entire lack of *ante mortem* symptoms, and the fact that there was no observable trauma on either the internal or superficial aspect of the hide. It also demonstrates the facility with which herniation of the abdominal contents could occur following this type of injury.

Yours faithfully,

OLAF SWARBRICK.

Surrey House,
Arundel,
Sussex.

January 7th, 1957.

New Records of Nematodes from British Cattle

Sir,—In their paper in THE VETERINARY RECORD of December 22nd, Drs. Morgan and Soulsby give a list of the nematodes which have been recorded as parasitic in the alimentary canal of British cattle. To this list should be added *Nematodirus spathiger* which has been the commonest species of *Nematodirus* recovered from bovine material submitted for diagnostic examination at this laboratory. Reference to our records shows that of material from 14 cattle recently examined, no less than nine contained *N. spathiger* and the other five *N. filicollis*.

Yours faithfully,

T. E. GIBSON.

Ministry of Agriculture Veterinary Laboratory,
New Haw,
Weybridge,
Surrey.

December 28th, 1956.

Pathological Material Required

Sir,—I am engaged in a study of the pathology of the uterus of the bitch in false pregnancy, and its relation to so-called pyometra, and I am experiencing difficulty in obtaining material from cases.

I fully appreciate the difficulty of inducing a client to have a bitch spayed with this condition, but spaying the persistent case may well avoid a pyometra at a later date. The advantages of operating at an earlier date seem thus to be obvious.

I have received a great deal of material from one member of the profession for which I am very grateful, but I should welcome more from any of those who would be good enough to send to me. The ovaries from these cases are of particular interest.

Yours faithfully,

J. C. WHITNEY.

Royal (Dick) School of Veterinary Studies,
Edinburgh, 9.

December 20th, 1956.

An Acknowledgment

Sir,—Inadvertently, I omitted to acknowledge my very real thanks to the staff of the Animal Nutrition Department of Unilever's Ltd., Bedford, for the facilities they recently accorded me in the evaluation of chloramphenicol in the treatment of porcine virus pneumonia (*Vet. Rec.* **68.** 1,048).

May I take this opportunity, therefore, of rectifying this omission by expressing my sincere appreciation for their whole-hearted co-operation in this respect.

Yours faithfully,

R. JONES PUGH.

Parke, Davis & Company, Limited,
Staines Road,
Hounslow,
Middlesex.

January 4th, 1957.

ADVERTISERS' ANNOUNCEMENTS

For convenience of internal administration, the business and assets of IMPERIAL CHEMICAL (PHARMACEUTICALS) LIMITED have been transferred to IMPERIAL CHEMICAL INDUSTRIES LIMITED PHARMACEUTICALS DIVISION, and as from January 1st, 1957, the business of I. C. (P) will be carried on by that Division.

There will be no change in the methods by which I. C. (P)'s business has been conducted, in the range of products at present sold, or in the staff by whom the business is carried on.

BURROUGHS WELLCOME & CO., announce that "Wellcome" brand Feline Infectious Enteritis Vaccine is now issued under the trade mark "Fiovax," in a pack containing 2 by 1 c.c. vials

DISEASES OF ANIMALS ACT, 1950—GREAT BRITAIN

Summary of Returns of Confirmed Outbreaks of Scheduled (Notifiable) Diseases

Period		Anthrax	Atrophic Rhinitis	Foot-and-Mouth	Fowl Pest	Sheep Scab	Swine Fever
1st to 15th December, 1956		12	—	9	113	—	18
Corresponding period in	1955	26	1	—	145	—	41
	1954	22	—	—	40	—	51
	1953	20	—	4	64	—	75
1st January to 15th December, 1956		1,230	11	155	884	—	718
Corresponding period in	1955	747	7	7	769	—	1,372
	1954	325	4	12	757	—	1,387
	1953	589	—	39	926	—	2,653